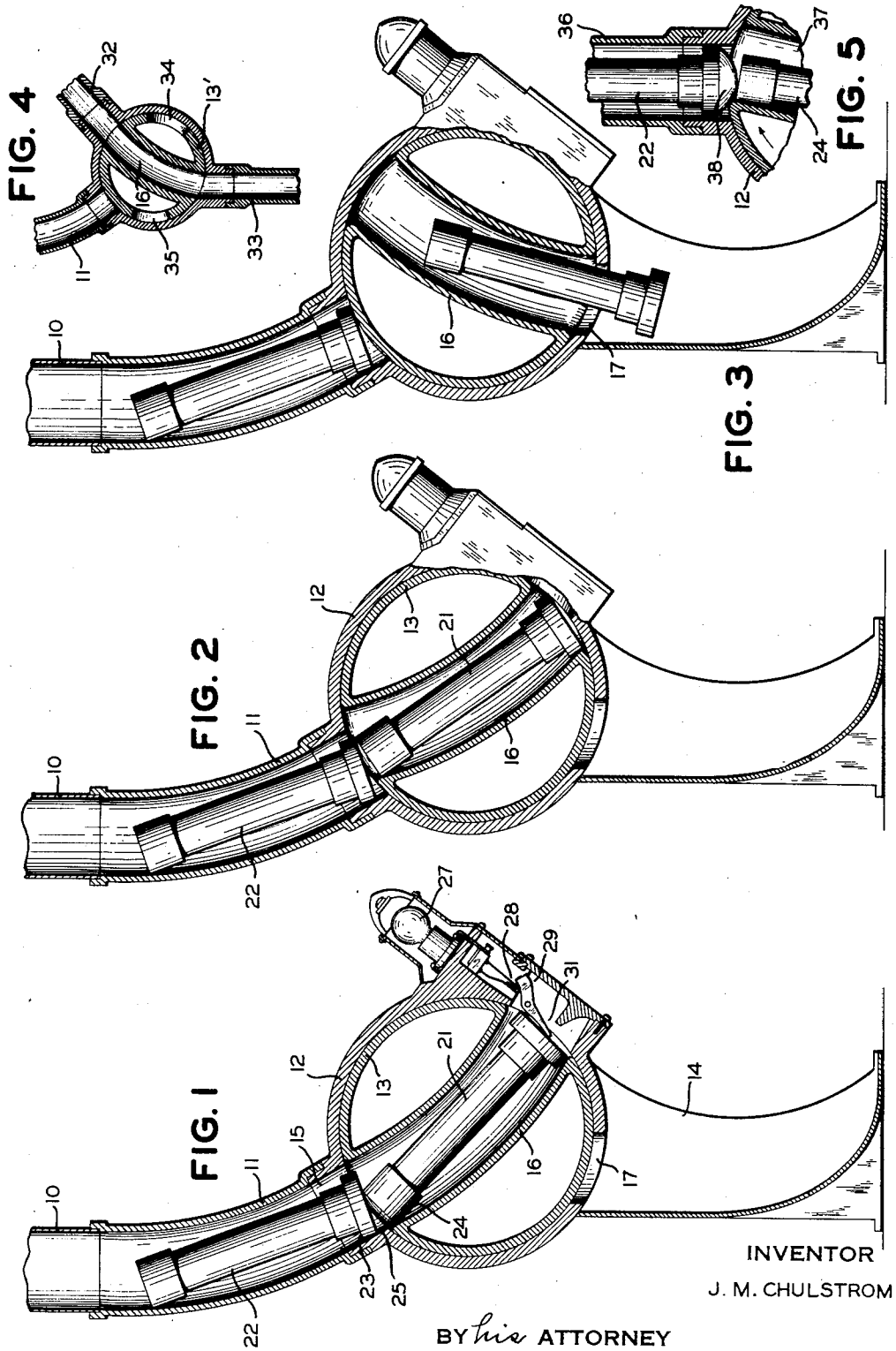
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PNEUMATIC CONVEYER RELAY OR TERMINAL

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PNEUMATIC CONVEYER RELAY OR TERMINAL

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This invention relates to receiving, relaying or sending stations for pneumatic tube conveyers, more particularly to stations for high pressure or high vacuum pneumatic conveyers arranged to separate and discharge carriers from the tube or carrier passageway and at the same time to maintain the tube closed.

It is well known in the art to employ receiving terminals for pneumatic conveyers, especially where high pressures are employed, embodying a movable discharge member having a chamber or passageway which may be set in one position in alinement with the passageway at the end of the conveyer tube for receiving the carrier from the tube, and which may be moved out of alinement with the passageway so as to close the end of the tube while the chamber in the movable member is brought into line with a discharge opening which allows the carrier to be discharged from the terminal. It will be observed that in this type of receiving terminal two separate functions must be performed. One of these, which is desirable in connection with high pressure systems, is to close the end of the conveyer tube or carrier passageway to prevent the escape of air and consequential loss of pressure. The other function is to separate the carriers to be removed, from the tube or carrier passageway before they are discharged from the receiving terminal.

However, as heretofore constructed, it has been necessary with receiving terminals of the foregoing type to employ trigger or cam means to engage the approaching carrier and hold it out of contact with the carrier which has entered the movable discharge member and also out of contact with the movable member so that the latter may be readily moved from receiving position to discharge position. However, such construction involves complicated parts which are difficult to regulate and easy to get out of order.

One of the objects of the invention is, therefore, to provide a simplified arrangement employing a single movable element for performing these functions in order that the usual cams, triggers, or the like, for restraining the movement of approaching carriers while the carrier is being separated from the passageway and discharged, may be dispensed with.

Another object is to provide a signal operating mechanism for indicating the presence of a carrier in the terminal, and also for indicating when the receiving chamber is in proper alinement.

In accordance with the invention, I relatively arrange the terminal portion of the carrier tube and the receiving chamber in the movable receiving member so that a first carrier resting in the receiving chamber and a second carrier resting in an adjacent position in the terminal portion of the carrier tube will embody an angular space between their adjacent ends which may be taken advantage of by receiving member as it moves toward discharge position to more effectively separate the carriers without employing additional movable members. The movable carrier receiving member has a carrier receiving passageway angularly disposed to the carrier tube terminal portion and an abutment arranged to engage the end of the next carrier approaching the receiving terminal to provide a support therefor, as the movable member is moved into discharge position.

In the discharge position of the movable carrier receiving member, the incoming tube is sealed by an imperforate wall of the receiving member and the passageway thereof is placed in communication with a discharge chute whereby the carrier may pass into a suitable receptacle or, where the apparatus is used at a sending or relay station, the opposite ends of the passageway may be placed in alinement with a source of air pressure and with the outgoing tube, respectively.

These and other objects are effected by my invention as will appear from the following description in connection with the accompanying drawing forming a part of this application in which:

Fig. 1 is a sectional view of a receiving terminal showing the respective positions of the carriers when the movable member is disposed with the receiving chamber in alinement with the end section of the conveyer tube and also the arrangement of a signal device for indicating the presence of a carrier in the receiving terminal;

Fig. 2 is a view partly in section showing the movable member rotated slightly toward a discharge position;

Fig. 3 is a view partly in section showing the movable member rotated into discharge position and the carrier being discharged therefrom;

Fig. 4 shows the arrangement at a sending or relay station; and

Fig. 5 shows a modification in which the tubes are substantially straight.

Referring to the drawing, the preferred embodiment of my invention comprises a conveyer tube 10 connected with a terminal or end section 11 which is joined to a circular housing 12 enclosing the movable terminal member in the form of a drum or rotor 13. The housing is

suitably supported by a bracket member 14 which is curved to form a discharge chute for the carriers. An opening 15 in the housing forms a continuation of the end section of the carrier tube or passageway and connects the same with an elongated receiving chamber 16 of substantially the same length as a carrier, extending through the rotor. The rotor is fitted into the housing 12 and may be provided with suitable means for rotating it into one position such that the chamber 16 is brought in line with the tube terminal section 11, and into another position such that the periphery of the rotor is moved across the conveyer tube to form a closing valve for preventing the escape of air and loss of pressure in the system and at the same time, the passageway 16 is brought into alinement with an opening 17 in the casing through which the carrier 21, enclosed in the rotor, may escape or be discharged. While the chamber 16 of the rotor is in alinement with the end of the carrier tube, the housing 12 forms a closing valve at the outer end of the chamber. In this manner, air is prevented from escaping through the terminal at either position of the rotor.

As shown in the drawing, the terminal section 11 of the carrier tube and the chamber 16 are arranged to form a continuous passageway arcuate in shape. By reason of the arcuate shape, a first carrier 21 disposed in the chamber 16 of the rotor and a second carrier 22 disposed in the terminal section 11 will be held in angular relation to each other and the head 23 of the second carrier will rest on the edge of the collar 24 of the first carrier with an angular space 25 included between them. Although the passageway in its preferred form, is a continuous arcuate passageway, straight passageways may be employed in the tube terminal section and the rotor and these disposed in angular relation to each other. Strictly speaking, adjacent sections of the arcuate passageway leading into the receiving terminal may be considered as being angularly disposed in relation to each other, inasmuch as an arcuate line may be described as a line, adjacent increments of which are disposed in angular relation to each other. Furthermore, any other suitable arrangement may be employed which will hold the carrier in the receiving terminal in angular relation to the adjacent carrier in the tube terminal section.

With the arrangement just described, the separation and discharge of the carriers from the conveyer tube may be accomplished substantially in the following manner. A carrier, for example, carrier 21 approaches the end of the conveyer tube 11 and proceeds downwardly under the cushioning effect of the air entrapped in front of the carrier head and reaches the chamber 16 in the rotor or drum 13 as the air escapes around the head of the carrier and comes to rest in the position shown in Fig. 1. A second carrier, for example, carrier 22, which may be traveling a short distance behind the first carrier approaches the end of the conveyer tube and similarly comes to rest, in the position shown in Fig. 1, with its head portion 23 resting on the collar 24 of the first carrier. In this position the angular space 25 will separate the outer edges of the head and collar respectively. The diameter of the rotor 14 is such that it extends at least up to the end of the carrier 21 and preferably slightly beyond the end of the carrier so as to form a movable abutment disposed to enter the angular space 25 when the rotor is rotated.

In order to separate the first carrier from the second carrier and simultaneously close the passageway in the end section of the tube 11, which will usually contain air under substantial pressure or vacuum, the rotor 13, embodying a carrier 21 in the receiving chamber, is rotated in a clockwise direction so that the upper end of the carrier 21 is separated from the carrier 22 by a relative transverse movement of their engaged ends and at the same time the body portion of the rotor moves across the passageway of the tube terminal section and into the angular space 25 finally engaging the protruding head of the carrier 22, with a separating action and forcing the carrier 22 back up into the tube 11. Continuing the rotation the body portion of the rotor slides across the head of the carrier 22 and finally closes the passageway, preventing the escape of air therefrom and at the same time the lower end of the chamber 16 is brought into alinement with the opening 17 and the carrier is discharged from the rotor by dropping through the opening into the chute 14.

After the carrier has been discharged, the rotor 13 is rotated in a counterclockwise direction to again bring the receiving chamber and the tube passageway in alinement. In this position the adjacent carrier 22 can now move down into the receiving chamber 16 in the rotor.

From the foregoing description it will be observed that the approaching carrier 22 is permitted to come to rest at first on the upper end of the carrier 21 and that as the separating movement of the rotor or drum 13 takes place, without the necessity of providing a separate supporting member for the approaching carrier or without lifting the carrier from its first position of rest, the abutment portion of the rotor body moves in and supports the second carrier during the discharge operation of the receiving terminal.

Although I have described the movable portion of the receiving terminal which accomplishes the separation and discharge of the carriers as incorporated in a rotor member, the same functions may be performed by any type of movable member which separates the ends of the carriers by a transverse movement and provides an abutting member which moves into the angular space disposed between the adjacent ends of the carriers simultaneously with the separating action. It is to be noted that the effectiveness of the separating action is due mainly to the fact that the movable member incorporating the receiving chamber 16 is brought into discharge position by a movement which takes place in a direction transversely and at an angle to the end of the approaching carrier, permitting an abutting element to move into engagement with the end of the carrier without coming in contact with the front edge portion of the carrier head.

According to this invention, means may also be provided for indicating the fact that a carrier has been received in the receiving terminal. Referring to Fig. 1, a signal device may be provided in a form of a lamp 27 and a suitable circuit therefor including switch contact members 28 biased toward an open position and arranged to be closed by a pivotally mounted lever 29 having a lower end 31 disposed to be engaged by the head of a carrier as it comes to rest in the receiving terminal. Due to the fact that the upper end of the lever 29 is relatively heavier than the lower end, when no carrier is present

in the terminal, the lever will swing in a clockwise direction permitting the contacts 28 to open and cut off the signal device. When the rotor member is moved into discharge position, it will be observed that the peripheral wall of the valve or rotor will engage the lever 29 and maintain the signal circuit closed until the valve is returned to its normal position with its passageway in alinement with the conveyer tube 11. In this manner the signal device not only serves to indicate when there is a carrier in the terminal but also when the valve has been brought back to proper position. If the valve has not been returned to correct position, the carriers could not enter the valve chamber 16 nor actuate the signal. With the additional signal feature this is not apt to occur.

From the foregoing it will be observed that I have provided a receiving terminal adapted to be employed in connection with pneumatic tube conveyers of a high pressure type, which performs the function of providing a valve which maintains the end of the tube closed and at the same time separating a certain number of carriers from the tube and discharging the same by employing only one movable element. The apparatus has been simplified as compared with the type heretofore employed and all trigger or cam devices employed for checking or restraining the movement of the adjacent carrier approaching the receiving terminal have been omitted. In addition, a device has been provided which may be incorporated in a design embodying several features of improved appearance and adaptability.

In Fig 4 I have shown an arrangement for use at a sending or relay station. The rotor 13' is shown in discharging position, in which position the upper end of the chamber 16 is in communication with a source of air pressure 32 and the lower end is in alinement with the outgoing tube 33 leading to the distant station. The carrier may be deposited by hand in the inlet tube 11, usually from the floor above, or one or more incoming tubes may discharge therein. The rotor 13 is oscillated back and forward between the positions shown in Figs. 1 and 3, periodically, so as to transfer the carriers to the outgoing tube in definitely spaced relation. When the rotor is in receiving position, with the chamber 16 in alinement with the tube 11, air pressure is supplied to the outgoing tube 33 through the parts 34 and 35, which at this time are disposed opposite the air inlet 32 and outgoing tube 33, respectively.

In Fig. 5 I have shown a further modification in which the inlet tube 36 and chamber 37 of the rotor are substantially straight, the forward contacting ends 38 of the carrier being convex so as to provide a diverging or angular space between the carriers, into which the edge of the rotor or separating device may enter to force the carriers apart. In this figure, the rotor is shown slightly advanced from its receiving position with the nose of the rotor about to lift the upper carrier 22 into the tube 36.

While I have shown my invention in but three forms, it will be apparent to those skilled in the art that it is not so limited, but is susceptible to various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or as are specifically set forth in the appended claims.

I claim:

1. In a pneumatic carrier terminal having a carrier tube joined thereto, means for forming a valve at the end of the carrier tube through which carriers may be discharged, means for separating the carriers to be discharged from the remaining carriers, and means for supporting the remaining carriers during the discharge operation, all of said means being incorporated in one movable element.

2. In a pneumatic carrier station, a carrier valve, a conveyer tube joined thereto and embodying a carrier passageway, said valve comprising a movable discharge member embodying a receiving chamber, disposed in angular relation to said carrier passageway when in alinement therewith.

3. The combination in a pneumatic carrier system of a receiving terminal, a conveyer tube joined thereto and embodying a carrier passageway, and a movable discharge member in said receiving terminal embodying a receiving chamber, said receiving chamber and said carrier passageway when in alinement being so disposed in relation to each other that a carrier resting in the receiving chamber and a carrier resting in the terminal portion of the conveyer tube have an angular space formed between adjacent ends, said movable member being adapted to simultaneously close the passageway across said carrier tube and separate the carriers by moving across said angular space between the adjacent ends of the carriers.

4. In a pneumatic carrier system, a receiving terminal, a carrier tube having an end section joined to the receiving terminal and embodying a carrier passageway, said receiving terminal comprising a movable discharge member embodying a receiving chamber, said receiving chamber and said carrier passageway when in alinement being arranged to form a continuous arcuate passageway.

5. In a pneumatic conveyer discharge, the combination of a conveyer tube having a carrier passageway, a receiving terminal joined to the end of the conveyer tube, said receiving terminal comprising a shiftable discharge member having a receiving chamber for receiving a first carrier to be discharged, the terminal portion of said conveyer tube being arranged to receive a second carrier to be discharged, said shiftable discharge member being operable to simultaneously separate the first and second carriers and close the passageway at the end of the conveyer tube by a movement transversely of the carrier tube and at an angle to the end of the second carrier.

6. A pneumatic carrier station comprising, in combination, a housing embodying a carrier receiving opening and a carrier discharge opening, a valve member in said housing embodying a carrier receiving chamber, said valve member being shiftable from a position with the chamber in alinement with the receiving opening to a position with the chamber in alinement with the discharge opening, and a carrier tube connecting with the housing through the receiving opening, said carrier tube being angularly disposed with respect to the receiving chamber when in alinement with the receiving opening.

7. A pneumatic carrier station comprising, in combination, a circular housing embodying a receiving opening and a discharge opening, a rotor member in said housing embodying an elongated arcuate carrier receiving chamber, said rotor member being rotatable to bring the receiving

chamber in alinement with the receiving opening in one position and in alinement with the discharge opening in another position, and a carrier tube having an arcuate terminal portion connecting with the housing through the receiving opening, said tube terminal portion, said receiving opening, and said chamber being arranged to provide, when in alinement, an arcuate passageway.

8. In a pneumatic carrier station, the combination of a conveyer tube, a circular housing having an inlet and discharge opening, said housing being joined to the end of the conveyer tube through the inlet opening, a rotor disposed in said housing and embodying a carrier receiving chamber disposed, when in alinement with the conveyer tube, to receive a carrier and hold the same in an angular relation to an adjacent carrier in the tube, said rotor being arranged to utilize the angular relation between the carriers as it moves from the aforesaid position into alinement with the discharge opening, to simultaneously separate the carriers and form a closing valve for the end of the tube.

9. In a pneumatic carrier system, a carrier tube, and a terminal apparatus for discharging consecutive carriers one at a time from said tube, said terminal apparatus embodying a first means for receiving the first carrier to be discharged and a second means to receive a second carrier in an adjacent position thereto, said first and second means being arranged to hold the adjacent carriers in angular relation to each other, said means also being movable relative to each other to simultaneously separate the first carrier from the second and support the second carrier in the tube and close the end of the carrier tube while the first carrier is being discharged.

10. A pneumatic carrier terminal comprising in combination, a circular housing embodying a receiving opening and a discharge opening, a carrier tube connecting with the housing through the receiving opening, an oscillatory member in said housing embodying an elongated receiving chamber of substantially the same length as a carrier and disposed, when in alinement with the end of the carrier tube, to receive a carrier and hold the same so as to form an angular space between the end of the latter and the succeeding carrier resting adjacent thereto, said rotor being arranged to enter said angular space as it is rotated toward discharge position, after receiving a carrier, to check the approaching carrier and separate the carrier in the chamber from the approaching carrier in the carrier tube.

11. A pneumatic carrier terminal comprising, in combination, a circular housing embodying a receiving opening and a discharge opening, a carrier tube connecting with the housing through the receiving opening, a rotor member in said housing embodying an elongated receiving chamber of substantially the same length as a carrier and disposed to receive a carrier at an angle to the end section of the carrier tube when in alinement therewith, and means cooperating with the rotor member to indicate whether the chamber is in receiving position, and when in said position to indicate whether a carrier has been received, said rotor being arranged when rotated toward discharge position, after receiving a carrier, to bring the receiving chamber in alinement with the discharge opening and discharge the carrier therethrough.

12. In a pneumatic tube system, a sending or relaying apparatus, a carrier magazine for said apparatus, an outgoing tube connected thereto, a carrier shifting member movable from adjacent the outlet of said magazine to adjacent the inlet of said outgoing tube, said member having means engageable between a carrier therein and a carrier in the magazine, to separate the same, and means for maintaining a continuous flow of air through the outgoing tube in either position of the carrier shifting member.

13. In a pneumatic tube system, a carrier segregating apparatus, a carrier magazine for said apparatus, a discharge passageway therefor, a carrier shifting member adapted to receive a carrier from said magazine and to discharge it into said discharge passageway, said member having means movable between a carrier therein and a carrier in said magazine to disengage one carrier from the other.

14. In a pneumatic tube system a carrier segregating apparatus, inlet and outlet tubes connected to said apparatus, carriers for said system, a segregation chamber for receiving the carriers one at a time from said inlet tube and delivering them in like manner to the outlet tube, a first means for consecutively connecting and disconnecting the inlet tube from said chamber, said first means operative to simultaneously separate a carrier in the inlet tube from an adjacent carrier in the chamber, and a second means for consecutively connecting and disconnecting the outlet tube to said chamber, said second means operative to discharge the carrier from the chamber when the latter is connected to the outlet tube, said first means being operated in such phase relation to the second means that the inlet tube is connected to the chamber while the outlet tube is entirely disconnected from the same and vice versa.

15. In a pneumatic tube system a carrier segregating apparatus, inlet and outlet tubes connected to said apparatus, carriers for said system, a segregation chamber for receiving the carriers, and valve means operative from a single source, firstly, to cut off the outlet tube from said chamber and while the outlet tube remains cut off to connect the inlet tube to the chamber for receiving a carrier from the inlet tube, and secondly, to cut off the inlet tube from said chamber and while the inlet tube remains cut off to connect the outlet tube with the chamber for discharging the carrier therefrom, said valve means at the inlet tube being characterized by the fact that as it cuts off the inlet tube it simultaneously acts to separate the carrier in the chamber from the remaining carriers in the inlet tube.

16. In a pneumatic tube system, a carrier segregating apparatus having a passageway, a portion of which is so shaped as to position adjacent carriers therein with their axes out of alinement for providing a divergent space therebetween, means to arrest the travel of the carriers in this portion of the passageway, means providing for the section of the passageway enclosing the lower arrested carrier to be moved transversely of the passageway and separate the enclosed carrier from adjacent following carrier by moving the enclosed carrier across the face of the end of the adjacent carrier in the passageway in a direction toward the closed side of said divergent space.

17. In a pneumatic tube system, a carrier segregating apparatus comprising a carrier passageway adapted to receive a plurality of carriers, means in said passageway to arrest the motion of

the carriers, the portion of said passageway enclosing the lower arrested carrier being movable transversely of the passageway, and comprising an enclosing chamber for the carrier, said chamber being arranged to position the enclosed carrier with its longitudinal axis at an angle to the axis of the adjacent following carrier in the passageway for providing a divergent space between the ends thereof, said enclosing chamber being arranged to separate the carrier therein from the adjacent carrier by moving transversely of the passageway at an angle to said adjacent carrier, whereby the edge of said chamber moves into said divergent space causing the end of the adjacent carrier to slide over said edge.

18. In a pneumatic type system the combination of a housing embodying a carrier receiving opening and a carrier discharging opening, a valve member in said housing embodying a carrier receiving chamber, said valve member being shiftable from a position with the chamber in alinement with the receiving opening to a position with the chamber in alinement with the discharging opening, a carrier passageway connecting with the housing through the receiving opening, a plurality of carriers in said passageway, each carrier having at least one of its ends of a convex form, whereby a divergent space is formed between the ends of adjacent contacting carriers, said valve member being provided with means movable into said space when one of two adjacent carriers is in said valve chamber to separate said latter carrier from the former as the valve is rotated to move the chamber from a receiving into a discharging position.

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